TRANSPOWER

August 2020

Whakamana i Te Mauri Hiko

Empowering our energy future

A once-in-a-lifetime opportunity to transform our economy

New Zealand has a highly renewable electricity system. But our broader energy system, covering our transport and industrial sectors, remains highly dependent on coal, oil and gas.

Transpower is New Zealand's national grid operator. We have a whole-of-industry view of the electricity sector and operate the system on behalf of New Zealand. Over the last two-and-a-half years we have used our best analysts, engineers and strategists to evaluate what New Zealand's energy future looks like.

The results of this work are summarised in our new *Whakamana i Te Mauri Hiko – Empowering our Energy Future* report. The facts are now beyond dispute: New Zealand has a unique opportunity to deliver lower energy prices to consumers, create thousands of high-skilled jobs, generate distinct competitive advantage for our economy and meet our international climate change commitments.

Rio Tinto's announcement to start planning for the wind-down and eventual closure of New Zealand's Aluminium Smelter (NZAS) at Tiwai Point is a significant change for the people and the region of Southland. In this context, the opportunity to use renewable electricity to create new jobs and industries, and to decarbonise our economy, has become more immediate and important.

We must seize this opportunity to develop new low carbon industry and to rapidly electrify our transport fleet, our industry which largely uses coal and gas for processes like drying milk, and our buildings where we still use coal to heat some hospitals and schools.

The benefits of decarbonising our entire economy through widespread electrification are profound.

It is a unique opportunity that we must seize now.
There is no time to waste and we cannot afford to fail.

Accelerated electrification: the only way to meet our climate change commitments

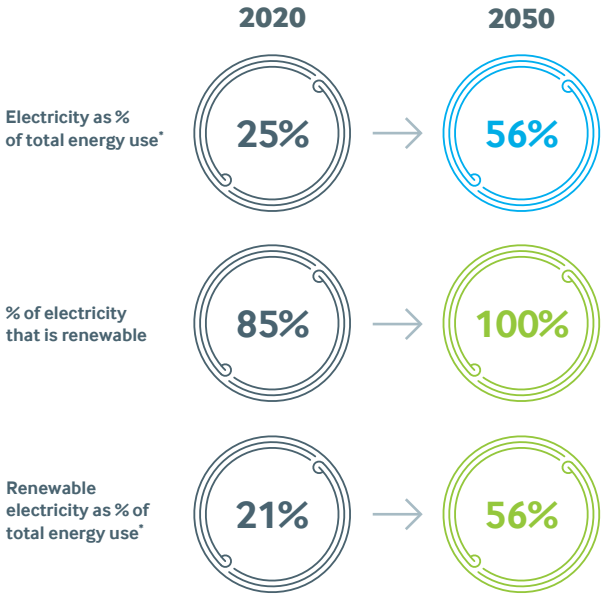
New Zealand has a proud history of leading the world on the issues that matter. One of the most defining issues of the 21st century will be our response to climate change.

We've made bold commitments as a country on the world stage. We've committed to the Paris Climate Change Accord. It requires New Zealand to cut emissions by 30% below 2005 levels by 2030. We've also committed to being net zero carbon by 2050. We are currently not on track to meet these commitments.

To meet these commitments, every part of the economy will need to contribute. New Zealand's electricity sector is currently 80 to 85% renewable, which is high, but our overall energy mix is only 40% renewable. By 2050, we forecast electricity will represent nearly 60% of total energy use, up from 25% today, and renewables can provide 100% of all electricity.

The exit of NZAS provides new opportunities to rapidly accelerate the transformation of our energy systems and future-proof our economy with new jobs and industries. The NZAS decision makes it all the more important that New Zealand has an integrated 30-year plan, supported by policy, to carefully guide the rapid transition to renewable energy across our economy.

Figure 1: **Our future energy profile**

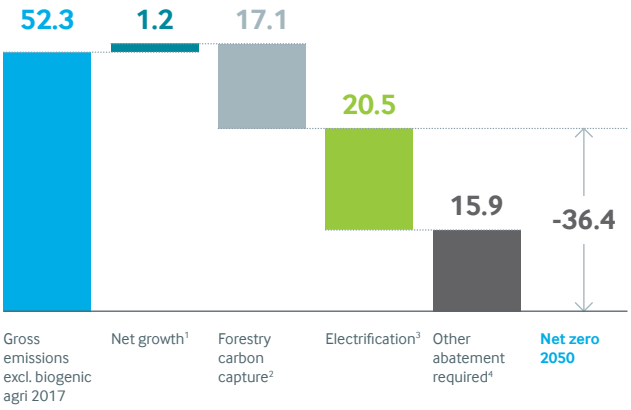


While net growth and base growth are used across this document, both refer to total growth. Net growth is used to define emissions growth. Base growth is used to define growth in electricity demand.

* Based on Consumer Energy use rather than Primary Energy use

Electrification can provide over 50% of the non-forestry emissions reductions required to meet our 2050 net zero carbon target. We will also require other renewable fuel sources such as biomass, hydrogen, biogas, direct geothermal heat and biofuels to deliver other abatement required.

Figure 2: **Zero Carbon Target 2050**
(Million tonnes of carbon dioxide equivalent)



1 Net growth is composed of additional energy requirements in transport and process heat combined with efficiency gains from delivering those energy requirements with improving fossil fuel technologies;
2 MfE forecast of forestry carbon sequestration recognised under Paris Agreement in 2030 extended to 2050 based on planting an estimated 0.6m additional forestry hectares;
3 Emissions reduction from electrification estimated in Whakamana i Te Mauri Hiko Tiwai Exit case;
4 Abatement required from other sources required to achieve each target.

What are the benefits of accelerated electrification?

Substituting gas, coal and imported oil with clean, renewable and efficient electricity could deliver enduring competitive advantage for the New Zealand economy; lower prices and more choices for consumers; and a cleaner, low carbon environment for future generations.

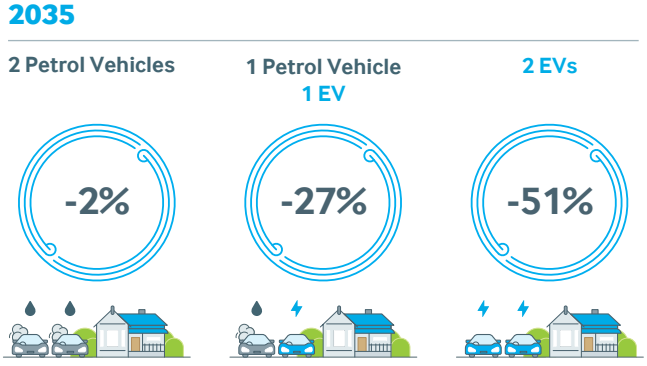
The lowest prices

The most likely future energy scenario will deliver significant cost reductions for consumers for three reasons:

1. **Renewable electricity is the cheapest form of energy available,** and the price of renewable technology continues to drop significantly.
2. **Continuously improving energy efficiency** allows consumers to enjoy the benefits of electricity at a lower cost.
3. **Electric vehicles (EVs) cost 70% less to run than a petrol-powered car.** At some point between 2025 and 2030, EVs will also be cheaper to purchase than petrol cars.

If we electrify our economy, by 2035, we forecast an average household with one EV could expect their overall energy bill to drop by more than a quarter.

Figure 3: **Predicted change in annual 2035 energy bill for household with two vehicles**



Creating jobs and transforming our workforce

Electrifying our economy will require the transformation of our workforce, requiring many thousands of new, highly-skilled workers in long-term, high-paying jobs over the next 15 years.

The power in our hands

A decarbonised economy will literally put the power in consumers' hands. It can be hard to imagine now, but an electrified energy system will involve millions of smart, connected devices in our homes and businesses: smart appliances; smart electric vehicle chargers; batteries and rooftop solar PV systems on our homes and businesses.

Consumers would be able to generate and store their own energy and decide when to sell it back to the network and at what price. The emergence of the household 'prosumer' – a consumer and producer of electricity – could help New Zealand avoid building more power stations and transmission lines than we need.

Our brand and competitive advantage

Successfully building a low carbon economy would build on New Zealand's international brand and increasingly market our products and our country as the climate-conscious choice.

We would have the opportunity to attract the tourists, the industries and the manufacturers of the future to our country. New Zealand could quickly become the world's number one choice for sustainable business.

The closure of NZAS at Tiwai provides an opportunity to think creatively around how some of this electricity could be used. Data centres, clean manufacturing plants, hydrogen production and electrification of South Island industrial heat processes are all possible ways to create new jobs, new industries and begin the transformation of our broader economy.

What's involved in accelerated electrification?

Transforming an economy requires a very good plan. For New Zealand to realise this opportunity and decarbonise our economy, a number of steps must be taken.

Getting the plan right

New Zealand needs a 30-year whole-of-energy-sector plan to decarbonise. Decisions around the future of NZAS make this plan all the more urgent. This plan must provide a roadmap as to how we can develop our energy resources and when; what technology and infrastructure is required; what policy and regulatory settings we will need. Without such a plan New Zealand is unlikely to realise this opportunity, or meet our international climate change commitments, in a coordinated and cost-effective way.

Targeting transport and industry

Currently, transport represents 20% of New Zealand's total greenhouse gas emissions. Process heat in industry and buildings makes up 10% – for example, burning coal or gas to provide heat for drying milk or for heating schools and hospitals.

We must prioritise these two sectors and put in place the policy to rapidly transform them from fossil fuels to more efficient and affordable renewable electricity.

We forecast New Zealand will have an estimated 1.5 million electric vehicles by 2035. Moving our transport from imported oil to electricity will save us all money, improve our trade balance and help build a more resilient economy.

Building the grid of the future

We estimate that the demand for electricity will increase by approximately 55% by 2050 as we switch away from fossil fuels and decarbonise our economy.

Figure 4: **Gross electricity demand**

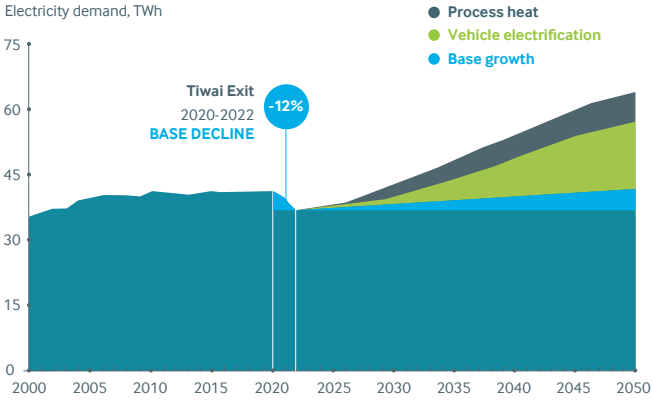
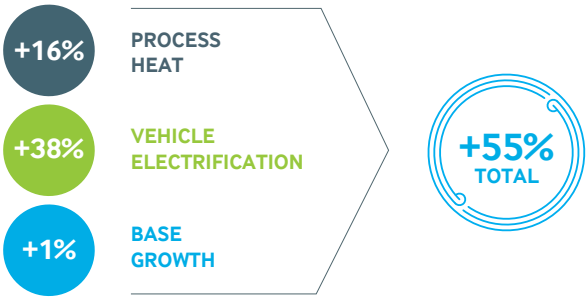


Figure 5: **Electricity demand growth contribution** 2020-2050



Transpower forecasts that this transformation will require 25 new grid-scale renewable power stations and battery storage projects over the next 15 years. This will also require significant grid upgrades to connect and distribute this renewable generation.

We need a modern, flexible and robust grid to distribute a wave of renewable energy projects to customers and to enable new technologies and energy markets to function properly – for example, connecting new electrification projects at industrial plants and enabling households to sell the electricity they generate back to the grid.

Work on this is already underway. We've planned for the possibility of NZAS closing and are already working on the Clutha to Upper Waitaki Lines project (CUWLP) in the lower South Island to enable more low cost, renewable hydroelectricity to shift north up the country. We are now commencing new modelling on potential further investments in the grid and will consult with industry on this in due course.

What do we need to change?

Starting with a comprehensive, long-term energy plan, building a low carbon economy requires a number of changes to the way we produce, distribute and consume energy, as well as policy and market settings.

In the immediate future, NZAS's closure is likely to accelerate a number of short-term changes to our energy system:

- A transition to 96% renewable electricity by 2025, primarily enabled by accelerated grid investment with a focus on new interconnections running from the South of New Zealand to the North to enable the transfer of more hydroelectricity;
- The potential accelerated retirement of some of New Zealand's thermal power stations, increasing dry year risk;
- Delay in some, but not all, new renewable generation projects and associated supply-side grid connections;
- Potential for accelerated new demand-side grid connections as electrification and new industries soak up some of the smelter's electricity.

In order to adapt to a post-smelter future and to deliver a highly renewable, affordable energy system, New Zealand needs to focus on the following areas:

Future Grid:

- **Faster connections:** Renewable energy projects are cheaper and faster to build than ever before. Transpower is working on ensuring we can connect them to the grid faster and more efficiently.
- **Improved grid planning:** Transpower continues to proactively plan for the grid of the future that will connect new renewable energy projects and enable a transition to a net zero carbon economy.

Figure 6:
Ten areas of change

Future policy:

- **New policy incentives:** The Emissions Trading Scheme will be the primary lever to deliver emissions reductions in New Zealand. But we also need complementary policies that actively support decarbonisation of our transport and industrial sectors.
- **Remove barriers:** We need to reform the Resource Management Act (RMA) to enable streamlined consenting of renewable energy projects and the transmission lines that service them.

Future markets:

- **New markets for distributed energy resources (DER):** Resources like electric vehicles, batteries, solar PV rooftop systems and smart appliances can provide significant value to the electricity system by alleviating peak demand periods, reducing the need for more generation and transmission projects.

  New markets and improved price signals are required to enable customers to maximise the value of these valuable resources.
- **Meeting demand in dry years:** New Zealand's hydro-dominated electricity system struggles when there is not enough water. Gas and coal are currently used to back up hydro when there are dry periods. In order to move to 100% renewable electricity, we will need new technologies and the right market signals to ensure we have a wide range of renewable resources that can provide similar back up services.

Future economy:

- **Workforce:** Electrifying our economy will deliver thousands of highly skilled jobs. To ensure the right skills are in place when we need them, the energy sector will need improved vocational training, greater workforce diversity, and a stronger sector brand that attracts young people motivated by the goal of decarbonising New Zealand.
- **Collaboration:** Transforming our economy and ensuring that the energy sector can play its part in a net zero carbon future will be a significant challenge. We will all need to rise to the challenge: Transpower, industry, businesses, government, regulators and all Kiwi consumers.

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